

WHAT IS CLAIMED IS:

1 1. A method for planarizing a borophosphosilicate glass (BPSG)
2 layer deposited over a substrate, said method comprising:
3 loading a substrate having a BPSG layer deposited thereover into
4 a substrate processing chamber, said BPSG layer having an upper surface that is
5 generally non-planar; and
6 exposing said substrate to an ultraviolet (UV) light at conditions
7 sufficient to cause a reflow of said BPSG so that said upper surface is generally planar.

1 2. The method as in claim 1, further comprising producing said UV
2 light with a UV lamp.

1 3. The method as in claim 1, further comprising producing said UV
2 light with a laser.

1 4. The method as in claim 1, wherein said UV light has a
2 wavelength of about $150 \text{ nm} \pm 50 \text{ nm}$.

1 5. The method as in claim 1, wherein said UV light has an energy
2 level that is greater than about 10 electron volts (eV).

1 6. The method as in claim 1, wherein said UV light has an energy
2 level that is about 15 eV.

1 7. The method as in claim 1, wherein said exposing step has a
2 duration that is between about thirty (30) seconds and about fifteen (15) minutes.

1 8. The method as in claim 1, further comprising maintaining a
2 temperature in said substrate processing chamber between about 20 degrees Celsius and
3 about 100 degrees Celsius during said exposing step.

1 9. The method as in claim 1, wherein said exposing step comprises
2 exposing said substrate to said UV light having a desired wavelength and a desired
3 energy level to break at least some SiOH bonds in said BPSG layer.

1 10. The method as in claim 1, wherein said exposing step densifies
2 said BPSG layer.

1 11. The method as in claim 1, wherein said BPSG layer comprises a
2 premetal dielectric (PMD) layer.

1 12. A method for planarizing an insulating layer deposited over a
2 substrate, said method comprising:
3 providing said substrate having said insulating layer deposited
4 thereover;
5 providing a UV light source;
6 exposing said substrate to UV light from said UV light source;
7 and
8 maintaining said UV light at conditions sufficient to reflow said
9 insulating layer to produce a generally planar insulating layer upper surface.

1 13. The method as in claim 12, wherein said insulating layer
2 comprises borophosphosilicate glass (BPSG).

1 14. The method as in claim 13, wherein said maintaining step
2 comprises maintaining said UV light at an energy level that is at least about 10 eV for a
3 duration that is at least about 30 seconds to produce said reflow of said BPSG.

1 15. The method as in claim 13, wherein said maintaining step
2 comprises maintaining said UV light at a wavelength of about 150 nm and for a
3 duration that is at least about 30 seconds.

1 16. A method of forming a planarized insulating layer, said method
2 comprising:
3 providing a substrate having a non-planar upper surface;
4 depositing an insulating layer over said upper surface, said
5 insulating layer having a generally non-planar upper surface; and
6 exposing said insulating layer to a UV light at conditions
7 sufficient to cause said insulating layer to reflow so that said insulating layer upper
8 surface is generally planar.

1 17. The method as in claim 16, wherein said insulating layer
2 comprises borophosphosilicate glass (BPSG).

1 18. The method as in claim 17, wherein said depositing step
2 comprises:
3 inserting said substrate into a substrate processing chamber; and
4 introducing a phosphorus-containing source and a boron-
5 containing source into said processing chamber to deposit said BPSG insulating layer
6 over said substrate.

1 19. The method as in claim 16, wherein said UV light has an energy
2 level that is at least about 10 eV.

1 20. The method as in claim 16, further comprising performing said
2 depositing and exposing steps in a substrate processing chamber.

1 21. The method as in claim 16, further comprising performing said
2 depositing step in a first processing chamber and said exposing step in a second
3 processing chamber.

1 22. A substrate processing apparatus comprising:
2 a processing chamber;
3 a substrate holder, located within said processing chamber, for
4 holding a substrate;
5 a UV light source coupled to said processing chamber and
6 disposed to transmit a UV light towards said substrate holder;
7 a controller for controlling said UV light source; and
8 a memory, coupled to said controller, comprising a computer
9 readable medium having a computer readable program embodied therein for directing
10 operation of said UV light source, said computer readable program including:
11 a first set of instructions for controlling a wavelength of
12 UV light produced by said UV light source; and
13 a second set of instructions for controlling a duration said
14 UV light source produces said UV light.

1 23. The apparatus of claim 22, wherein said computer readable
2 program further includes a third set of instructions for controlling an energy level of
3 said UV light produced by said UV light source.

1 24. The apparatus of claim 22, wherein said UV light source is
2 selected from a UV lamp and a laser.

1 25. The apparatus of claim 22, wherein said processing chamber
2 further comprises a window that is at least partially UV transparent, said window
3 positioned between said UV light source and said substrate holder.

1 26. The apparatus of claim 22, wherein said first set of instructions
2 operates said UV light source to produce said UV light having a wavelength that is
3 between about 100 nm and about 200 nm.

1 27. The apparatus of claim 22, wherein said second set of
2 instructions operates said UV light source for said duration between about thirty (30)
3 seconds and about fifteen (15) minutes.

1 28. The apparatus of claim 23, wherein said third set of instructions
2 operates said UV light source to produce said UV light having said energy level of at
3 least 10eV.

1 29. The apparatus of claim 22, further comprising a gas distribution
2 system coupled to said processing chamber for the deposition of an insulating layer on
3 said substrate.